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A STATISTICAL STUDY OF THE FATALITY OF TYPHOID FEVER AT DIFFERENT SEASONS.

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Introduction.

Study of the statistics of various typhoid epidemics suggested to me the idea that the isolated cases of the disease occurring in the late winter and spring months had a fatal termination in larger proportion than the much more numerous cases characteristic of the autumn. I have since found that this opinion is held by some practicing physicians on the strength of their personal observation. No exhaustive attempt has been made to study medical literature for references to this subject: one of the earliest writers on typhoid fever, however, Charles Murchison ("A Treatise on the Continued Fevers of Great Britain," London, 1862), quoted Chomel ("Leçons de Clinique Méd. Tom. 1. Fièvre Typhoide," Paris, 1834), Forget ("Traité de l'Enterite Folliculeuse," Paris, 1841), and Bartlett ("The Fevers of the United States," Philadelphia, 1856), as claiming that the fatality in France and America is doubled in the cold months. He also gave the following figures from the records of the London Fever Hospital for the period 1848–57: —

FATALITY OF TYPHOID FEVER, DEATHS PER 100 CASES, LONDON FEVER HOSPITAL, 1848-57.

Spring	19.82
Summer	18.03
Autumn	18.23
Winter	17.91

In the second edition of the same work, issued in 1873, Dr. Murchison extended his table up to 1870, as follows:—

FATALITY OF TYPHOID FEVER, DEATHS PER 100 CASES, LONDON FEVER HOSPITAL, 1848-70.

Spring (March, April, May)	16.99
Summer	17.98
Autumn	16.66
Winter	16.90

These results differ considerably from those published for the first period; but the author concluded, "it appears that the mortality was slightly less in autumn, when the disease was most prevalent."

The most recent monograph on typhoid fever ("Typhoid Fever and Typhus Fever," H. Curschmann; English version edited by W. Osler, 1901) adds nothing to the above suggestions, dismissing the subject in the following sentence: "The extent to which climate and season are operative in this connection appears to be not yet sufficiently determined, although Murchison believed that from a study of the statistics of the London Fever Hospital he was able to make out a greater mortality from typhoid fever in the spring."

It seemed to me worth while to attempt to discover whether any such relation between season and the fatality of typhoid fever really existed, both as a practical medical problem, and as one which might throw light on the theoretical questions which relate to the complex struggle between the human body and a parasitic micro-organism..

Statistics of Massachusetts and the City of New York.

I turned first to the reports of the State Board of Health of Massachusetts. In the statistical summaries of disease and mortality at the end of each of these reports is published a table of the weekly mortality returns, voluntarily made by

the officials of the principal cities and towns, comprising in 1900 about two-thirds of the total population of the State. The weekly deaths from typhoid fever, extracted from these tables for the five years, 1896–1900, form Table I appended to this paper. In another section of the statistical summaries of disease and mortality mentioned above is given a table of cases of infectious diseases reported to the State Board of Health by months. The reporting population is somewhat larger than that contributing to the returns of deaths, but as there is no reason to suspect any seasonal variation in the ratio of the populations the figures serve for the purpose of the present investigation. The monthly cases of typhoid fever, 1896–1900, obtained from this source will be found in Table II.

My second set of figures was obtained from the files of the New York City *Record*, in which the cases and deaths of the infectious diseases are published week by week. Table III was compiled from these weekly returns for the borough of Manhattan and the Bronx for the period 1896–1900.

The returns of the typhoid cases and deaths in these communities are summarized by quarters, with totals for the five-year periods, 1896–1900, in Tables IV (Massachusetts) and V (New York). It might at first appear that a fair idea of the relative fatality of the disease in the different quarters of the year could be obtained by calculating directly the ratio between the figures for the cases and the deaths in the last column of these tables. The result of this comparison is as follows: —

Typhoid Fever in Massachusetts, 1896–1900.

	Quarter.			
	First.	Second.	Third.	Fourth.
Cases	1,609	1,518	4,381	5,091
Deaths	375	284	636	763
Fatality (deaths per 100 cases)	23.3	18.7	14.5	15.0

TYPHOID FEVER IN NEW YORK CITY, 1896–1900.

	Quarter.			
	First.	Second.	Third.	Fourth.
Cases	702	711	2,799	2,847
Deaths	208	202	584	615
Fatality (deaths per 100 cases)	29.6	28.4	20.9	21.6

The absolute fatality rates have, of course, but little significance for the present investigation, and the fact that the rate in New York is so much higher than that in Massachusetts is probably due to more complete reporting of cases in Massachusetts, and to the fact that the population registering deaths in Massachusetts, as noted above, is not so large as that reporting cases.

There is one serious source of error, however, which affects the relative values for the different quarters, the only thing with which this paper attempts to deal. This error is introduced by the lapse of time between the reporting of a case of typhoid fever and its fatal termination. If the prevalence of the disease were constant throughout the year this factor would not be of great significance, but with the great variations which exist it becomes of importance. Thus it will be seen by reference to Table I that in Massachusetts at the beginning of the last quarter of 1896 typhoid deaths were occurring at the rate of 17 or 18 per week, while at the end of the quarter only 6 deaths a week were recorded. The deaths for several weeks at the beginning of the quarter really belong to the cases reported and progressing in the quarter preceding, and in their stead should be substituted the much smaller number of deaths registered for the first few weeks of 1897. The fatality rate for the last quarter of the year, as thus calculated, must, therefore, be larger than the true one. The only way to obviate this difficulty and to obtain a quarterly rate nearer the truth is to substitute for

the deaths reported in the first few weeks of each quarter the deaths reported in the corresponding weeks of the quarter next following, choosing as a correction factor that number of weeks which shall correspond as nearly as possible to the average time which elapses between the clear manifestation of a case of typhoid fever and its fatal termination. This last figure is, however, difficult to determine, as the course of the disease varies widely, death ensuing sometimes in the first week, sometimes in relapses after three months. I first took for my correction factor a period of six weeks, and by shifting the reported deaths back in the manner described, obtained Table VI. The totals for the five years, as calculated on this basis, with the resulting fatality rates, are as follows: —

TYPHOID FEVER IN MASSACHUSETTS, 1896–1900.

	Quarter.			
	First.	Second.	Third.	Fourth.
Cases	1,609	1,518	4,381	5,091
Deaths (corrected by shifting 6 weeks)	328	318	868	547
Fatality (deaths per 100 cases)	20.4	20.9	19.8	10.7

TYPHOID FEVER IN NEW YORK CITY, 1896–1900.

	Quarter.			
	First.	Second.	Third.	Fourth.
Cases	702	711	2,799	2,847
Deaths (corrected by shifting 6 weeks)	190	303	705	419
Fatality (deaths per 100 cases)	27.1	43.0	25.4	14.6

These results are striking; but the six weeks assumed for the duration of the disease in this calculation is too long a period. Just as the crude fatality rates for the last quarter of the year were too high because a large number of deaths resulting from September cases was compared with a small number of December cases, so here the over-corrected

rates for the last quarter are too low, because a small number of deaths in January and February are compared with a large number of cases in October. As has been stated, it is very difficult to determine the true mean for the time elapsing before death occurs in typhoid fever. According to Curschmann (*loc. cit.*), "The largest number of deaths in average epidemics of ordinary character occurs between the second half of the second and the end of the fourth week." Probably a correction factor of three weeks is as near an approximation to the truth as can well be made in order to refer as much as possible of the mortality to the morbidity with which it actually belongs. This value was, therefore, finally selected; and Table VII shows the deaths by quarters, corrected by shifting the actual figures back three weeks. The deaths for the first quarter of the year thus include those recorded for the fourth to the sixteenth week, inclusive. The fatality rates calculated on this basis then become as follows: —

Typhoid Fever in Massachusetts, 1896-1900.

	Quarter.			
	First.	Second.	Third.	Fourth.
Cases	1,609	1,518	4,381	5,091
Deaths (corrected by shifting 3 weeks)	340	285	781	650
Fatality (deaths per 100 cases)	21.1	18.8	17.8	12.8

Typhoid Fever in New York City, 1896-1900.

	Quarter.			
	First.	Second.	Third.	Fourth.
Cases	702	711	2,799	2,847
Deaths (corrected by shifting 3 weeks)	186	248	674	509
Fatality (deaths per 100 cases)	26.5	34.9	24.1	17.9

The rates obtained in this way are intermediate between those given in the two previous tables; and the considerable

change introduced by the shifting backward of the recorded deaths illustrates the dangers attendant upon any such procedure, and the necessity for extreme care in its application. It seems probable that the last table, in which the deaths have been shifted three weeks, more nearly represents the truth than do either of the others. All three tables show a distinctly lower fatality in the last two quarters, and especially in the last quarter, than occurs in the first half of the year. Although the difference is not great, it appears that in these instances Murchison's suggestion is confirmed. The fatality of typhoid fever seems to be slightly greater in the late winter and spring.

Statistics of the Cities of Berlin and Providence.

The New York and Massachusetts statistics are particularly suited for such a study as this, because of their weekly records of deaths. They may be supplemented, however, by calculations based on monthly statistics, for, it may be assumed, the shifting back of the deaths by a month instead of three weeks does not introduce a large error.

In the statistical year-book of the city of Berlin the reported cases of typhoid fever are given by months, with the total deaths from the disease, and the deaths occurring among cases previously reported. The first and third of these quantities for the ten years, 1889–98, have been extracted to form Table VIII of this paper. The deaths among the reported cases were, of course, chosen, rather than the total deaths, for closer comparability. Summing up the monthly totals, as given in Table VIII, directly, and calculating the fatality rates, the following table is obtained: —

TYPHOID FEVER IN BERLIN, 1889-98.

	Quarter.			
	First.	Second.	Third.	Fourth.
Cases	1,269	1,011	2,650	1,530
Deaths	225	144	270	247
Fatality (deaths per 100 cases) . . .	17.7	14.2	10.2	16.1

Here, as in the previous uncorrected tables, the rate for the last quarter is too high on account of the inclusion of deaths which belong to the cases reported in September, the maximum month of the year. By shifting the deaths back one month, so that the first quarter includes deaths in February, March, and April, and so on for the other quarters, a slight error, in the opposite sense, is introduced, but the result is probably much nearer the truth. The table as thus calculated is as follows: —

TYPHOID FEVER IN BERLIN, 1889–98.

	Quarter.			
	First.	Second.	Third.	Fourth.
Cases	1,269	1,011	2,650	1,530
Deaths (corrected by shifting 1 month)	217	155	303	211
Fatality (deaths per 100 cases)	17.1	15.3	11.4	13.8

Finally, the figures for one more American city, with a particularly excellent system of registration, came by chance to my attention. In the report of the superintendent of health of Providence, R. I., for the year 1900 was published a table of typhoid cases and deaths, which will be found in Table IX below. These figures have been summarized by quarters, first without change, and then with the same correction that was made in the case of the Berlin statistics.

TYPHOID FEVER IN PROVIDENCE, 1885–1900.

	Quarter.			
	First.	Second.	Third.	Fourth.
Cases	468	294	722	1,278
Deaths	161	131	186	324
Fatality (deaths per 100 cases)	34.4	44.6	25.8	25.4

TYPHOID FEVER IN PROVIDENCE, 1885–1900.

	Quarter.			
	First.	Second.	Third.	Fourth.
Cases	468	294	722	1,278
Deaths (corrected by shifting 1 month)	137	133	229	303
Fatality (deaths per 100 cases)	29.3	45.6	31.7	23.7

The fatality rates for Berlin and Providence, as thus finally calculated, bear out the conclusions obtained in the case of New York and Massachusetts. The relations between the first and second quarter, and between the third and fourth quarter, vary; but the second half of the year, on the whole, shows a distinctly lower fatality rate than the first half.

Statistics of the Massachusetts General Hospital and the Boston City Hospital.

The seasonal fatality rates, obtained by comparing the figures for registered deaths and reported cases as given in the official reports of boards of health, are open to two objections. In the first place, the shifting of the deaths for the purpose of referring them to the cases with which they really belong is a somewhat uncertain proceeding and may introduce error. In the second place, it is conceivable that the completeness of the reporting of cases varies slightly with the time of year. It may be that physicians are more on the lookout for typhoid fever in the autumn, when it is abundant, and report at that time light cases which might go unnoticed as mere diarrhœal disease in the spring.

Both these difficulties are obviated by the study of hospital statistics. The history of each individual being known there is no doubt as to the case to which any death belongs. And there is no reason to suppose that the character of the cases admitted at different seasons varies materially. I have, therefore, obtained, through the courtesy of Drs. G. H. M. Rowe and E. S. Abbot of the Boston City Hospital, and

Drs. H. B. Howard and Herman Gross of the Massachusetts General Hospital, the records of typhoid admissions at those institutions for periods of ten years. I wish here to express my thanks to those gentlemen for their permission to use these data. The figures, which will be found in Table X (Massachusetts General Hospital) and Table XI (Boston City Hospital) were obtained directly from the card catalogues of the hospitals. They include first, the total admissions of typhoid fever, arranged by months of admission; and second, the cases which terminated fatally, arranged also by months of admission. A direct comparison of the quarterly totals will thus give a true fatality rate for the cases admitted in each quarter of the year.

TYPHOID FEVER AT THE MASSACHUSETTS GENERAL HOSPITAL, 1891–1900.

	Quarter of Admission.			
	First.	Second.	Third.	Fourth.
Total cases	108	146	680	466
Cases terminating fatally	16	16	81	56
Fatality (fatal cases per 100 total cases)	14.8	11.0	11.9	12.0

In the first and second quarters these records show so small a number of admissions that the value of any generalization drawn from them is somewhat impaired.

TYPHOID FEVER AT THE BOSTON CITY HOSPITAL, 1888–97.

	Quarter of Admission.			
	First.	Second.	Third.	Fourth.
Total cases	244	376	1,496	1,029
Cases terminating fatally	43	65	183	111
Fatality (fatal cases per 100 total cases)	17.6	17.3	12.2	10.8

The relative fatality rates for the City Hospital coincide with those obtained by the study of the Massachusetts and New York statistics. Those for the Massachusetts General Hospital correspond, except that the rate for the second quarter is low. As noted above, in this case the total num-

ber of deaths included is so small that chance variation is not eliminated. The general bearing of the hospital statistics is to strengthen the inference that the fatality of typhoid is lessened in the autumn months.

Conclusions.

The results of all the statistics examined are summarized in the subjoined table for comparison. The rates for Massachusetts, New York, Berlin, and Providence are the final corrected rates, obtained in the first two cases by shifting the deaths back three weeks, and in the cases of Berlin and Providence by shifting them back one month.

QUARTERLY FATALITY OF TYPHOID FEVER.

	Quarter.			
	First.	Second.	Third.	Fourth.
Massachusetts	21.1	18.8	17.8	12.8
New York (city)	26.5	34.9	24.1	17.9
Berlin	17.1	15.3	11.4	13.8
Providence	29.3	45.6	31.7	23.7
Massachusetts General Hospital	14.8	11.0	11.9	12.0
Boston City Hospital	17.6	17.3	12.2	10.8

Inspection of this table shows that in four of the six cases the first quarter has the highest fatality; in three of the six cases the second quarter comes second; in four of the six cases the third quarter ranks third; and in four of the six cases the fourth quarter has the lowest fatality rate. In the whole series, excepting the figures for Providence and the Massachusetts General Hospital, the lowest rate for the first two quarters is higher than the highest recorded for the last two. In every instance the fatality for the first half year, as a whole, is distinctly above that for the second.

An explanation of this phenomenon must be based upon one of two factors, — a seasonal difference, either in the virulence of the typhoid bacillus or in the vital resistance of the human organism. As far as I am aware there is nothing to indicate that any increase takes place, but rather

the reverse, in the vigor of the germ in the first half of the year; if any thing, it is probably weakened by the winter. On the other hand, certain facts suggest that the resistance of the human body may undergo a variation which would account for the differing fatality. Studies of general seasonal mortality indicate that deaths from all causes are most numerous in the first quarter of the year, and suggest that, as might be expected, the vitality of the body is lowered at the end of winter. Thus in the *Report of the State Board of Health of Massachusetts for 1896* will be found a table of monthly mortality-rates which shows that for the period 1876–80 the average daily number of deaths in Switzerland, Germany, Austria, and France was constantly over the average for the year from December to May, and constantly under the average for the year for the other six months. In Italy, and in Massachusetts itself, two maxima appear; one in the first, and another in the third quarter. Several observers have pointed out that different classes of diseases contribute to these two maxima.

The winter death rate is raised by influenza, bronchitis, pneumonia, and other diseases which depend particularly upon a lowered vitality of their victims, attacking mainly the old and weak. The summer diseases, on the contrary, are the fevers and diarrhœal diseases of children, which are due mainly to the greater development of microorganisms at that season. The increased fatality of typhoid fever in the first quarter of the year may then be due to a general lowering of the vitality of the human body at that period. At any rate, a theory to that effect would explain the paradox that in spring, when the germs are presumably least numerous typhoid fever is most severe, and that this disease is least fatal in the autumn when the germs are probably most abundant.

In closing, I wish to express gratitude to Prof. W. T. Sedgwick and Prof. D. R. Dewey of the Massachusetts Institute of Technology for advice in the preparation of this paper.

TABLE I.

REPORTED DEATHS FROM TYPHOID FEVER IN MASSACHUSETTS ANNUAL REPORTS. STATE BOARD OF HEALTH. STATISTICAL SUMMARIES OF DISEASE AND MORTALITY, I.

1896.

First Quarter.		Second Quarter.		Third Quarter.		Fourth Quarter.	
Week Ending.	Deaths.	Week Ending.	Deaths.	Week Ending.	Deaths.	Week Ending.	Deaths.
Jan. 4 . .	8	April 4 .	4	July 4 . .	5	Oct. 3 . .	18
" 11 . .	8	" 11 .	5	" 11 . .	5	" 10 . .	13
" 18 . .	8	" 18 .	6	" 18 . .	6	" 17 . .	18
" 25 . .	6	" 25 .	7	" 25 . .	2	" 24 . .	17
Feb. 1 . .	9	May 2 .	2	Aug. 1 . .	6	" 31 . .	17
" 8 . .	8	" 9 .	4	" 8 . .	7	Nov. 7 . .	15
" 15 . .	8	" 16 .	7	" 15 . .	18	" 14 . .	15
" 22 . .	7	" 23 .	7	" 22 . .	10	" 21 . .	9
" 29 . .	3	" 30 .	5	" 29 . .	14	" 28 . .	9
Mar. 7 . .	6	June 6 .	6	Sept. 5 . .	7	Dec. 5 . .	12
" 14 . .	7	" 13 .	5	" 12 . .	14	" 12 . .	6
" 21 . .	3	" 20 .	2	" 19 . .	23	" 19 . .	6
" 28 . .	3	" 27 .	7	" 26 . .	12	" 26 . .	6

1897.

First Quarter.		Second Quarter.		Third Quarter.		Fourth Quarter.	
Week Ending.	Deaths.	Week Ending.	Deaths.	Week Ending.	Deaths.	Week Ending.	Deaths.
Jan. 9 . .	9	April 10 .	5	July 10 . .	9	Oct. 9 . .	15
" 16 . .	6	" 17 .	5	" 17 . .	4	" 16 . .	11
" 23 . .	10	" 24 .	5	" 24 . .	3	" 23 . .	12
" 30 . .	6	May 1 .	2	" 31 . .	2	" 30 . .	6
Feb. 6 . .	8	" 8 .	6	Aug. 7 . .	10	Nov. 6 . .	11
" 13 . .	5	" 15 .	2	" 14 . .	9	" 13 . .	9
" 20 . .	2	" 22 .	3	" 21 . .	10	" 20 . .	15
" 27 . .	6	" 29 .	3	" 28 . .	17	" 27 . .	11
March 6 . .	7	June 5 .	5	Sept. 4 . .	15	Dec. 4 . .	6
" 13 . .	6	" 12 .	0	" 11 . .	16	" 11 . .	9
" 20 . .	8	" 19 .	6	" 18 . .	14	" 18 . .	4
" 27 . .	1	" 26 .	5	" 25 . .	16	" 25 . .	17
April 3 . .	8	July 3 .	3	Oct. 2 . .	8	Jan. 1, '98 .	11

TABLE I.— *Continued.*

1898.

First Quarter.		Second Quarter.		Third Quarter.		Fourth Quarter.	
Week Ending.	Deaths.	Week Ending.	Deaths.	Week Ending.	Deaths.	Week Ending.	Deaths.
Jan. 8 . .	8	April 9 .	3	July 9 . .	5	Oct. 8 . .	17
" 15 . .	1	" 16 .	11	" 16 . .	1	" 15 . .	17
" 22 . .	5	" 23 .	4	" 23 . .	4	" 22 . .	17
" 29 . .	5	" 30 .	5	" 30 . .	4	" 29 . .	13
Feb. 5 . .	2	May 7 .	5	Aug. 6 . .	4	Nov. 5 . .	15
" 12 . .	6	" 14 .	3	" 13 . .	7	" 12 . .	16
" 19 . .	9	" 21 .	6	" 20 . .	9	" 19 . .	9
" 26 . .	2	" 28 .	2	" 27 . .	11	" 26 . .	4
March 5 . .	1	June 4 .	6	Sept. 3 . .	12	Dec. 3 . .	14
" 12 . .	3	" 11 .	4	" 10 . .	14	" 10 . .	7
" 19 . .	7	" 18 .	5	" 17 . .	18	" 17 . .	13
" 26 . .	7	" 25 .	2	" 24 . .	12	" 24 . .	15
April 2 . .	5	July 2 .	5	Oct. 1 . .	19	" 31 . .	6

1899.

First Quarter.		Second Quarter.		Third Quarter.		Fourth Quarter.	
Week Ending.	Deaths.	Week Ending.	Deaths.	Week Ending.	Deaths.	Week Ending.	Deaths.
Jan. 7 . .	8	April 8 .	7	July 8 . .	3	Oct. 7 . .	12
" 14 . .	14	" 15 .	8	" 15 . .	13	" 14 . .	12
" 21 . .	10	" 22 .	5	" 22 . .	6	" 21 . .	19
" 28 . .	5	" 29 .	4	" 29 . .	12	" 28 . .	10
Feb. 4 . .	3	May 6 .	6	Aug. 5 . .	9	Nov. 4 . .	11
" 11 . .	4	" 13 .	9	" 12 . .	14	" 11 . .	13
" 18 . .	8	" 20 .	4	" 19 . .	9	" 18 . .	13
" 25 . .	4	" 27 .	2	" 26 . .	10	" 25 . .	10
March 4 . .	3	June 3 .	1	Sept. 2 . .	6	Dec. 2 . .	8
" 11 . .	4	" 10 .	2	" 9 . .	14	" 9 . .	13
" 18 . .	4	" 17 .	5	" 16 . .	20	" 16 . .	7
" 25 . .	3	" 24 .	3	" 23 . .	13	" 23 . .	6
April 1 . .	5	July 1 .	0	" 30 . .	15	" 30 . .	6

TABLE I.— *Continued.*

1900.

First Quarter.		Second Quarter.		Third Quarter.		Fourth Quarter.	
Week Ending.	Deaths.	Week Ending.	Deaths.	Week Ending.	Deaths.	Week Ending.	Deaths.
Jan. 6	3	April 7	2	July 7	8	Oct. 6	15
" 13	7	" 14	2	" 14	5	" 13	16
" 20	9	" 21	7	" 21	3	" 20	13
" 27	7	" 28	7	" 28	4	" 27	15
Feb. 3	3	May 5	4	Aug. 4	6	Nov. 3	14
" 10	5	" 12	4	" 11	7	" 10	8
" 17	6	" 19	8	" 18	10	" 17	9
" 24	3	" 26	2	" 25	12	" 24	12
March 3	4	June 2	3	Sept. 1	10	Dec. 1	12
" 10	4	" 9	5	" 8	14	" 8	7
" 17	6	" 16	2	" 15	12	" 15	7
" 24	6	" 23	1	" 22	7	" 22	14
" 31	10	" 30	3	" 29	12	" 29	20

TABLE II.

REPORTED CASES OF TYPHOID FEVER IN MASSACHUSETTS. ANNUAL REPORTS STATE BOARD OF HEALTH. STATISTICAL SUMMARIES OF DISEASE AND MORTALITY, III.

Month.	Year.				
	1896.	1897.	1898.	1899.	1900.
January	144	178	112	146	140
February	92	83	76	73	84
March	72	78	104	102	125
April	65	86	95	135	80
May	108	94	86	81	119
June	114	96	95	100	164
July	135	98	93	158	150
August	321	242	240	385	241
September	409	311	471	567	560
October	609	410	393	447	600
November	346	226	253	306	344
December	222	178	178	256	323

TABLE III.

REPORTED CASES AND DEATHS FROM TYPHOID FEVER IN NEW YORK (MANHATTAN AND THE BRONX). NEW YORK CITY RECORD.

1896.

First Quarter.			Second Quarter.			Third Quarter.			Fourth Quarter.		
Week Ending.	Cases.	Deaths.	Week Ending.	Cases.	Deaths.	Week Ending.	Cases.	Deaths.	Week Ending.	Cases.	Deaths.
Jan. 11	13	5	April 11	3	0	July 11	15	5	Oct. 10	24	5
" 18	3	5	" 18	5	3	" 18	20	4	" 17	33	5
" 25	12	5	" 25	13	4	" 25	20	7	" 24	33	10
Feb. 1	8	3	May 2	3	2	Aug. 1	15	7	" 31	29	6
" 8	8	5	" 9	6	2	" 8	27	9	Nov. 7	26	4
" 15	7	2	" 16	8	1	" 15	37	15	" 14	22	7
" 22	12	8	" 23	5	4	" 22	48	10	" 21	38	6
" 29	7	5	" 30	10	3	" 29	15	6	" 28	31	10
March 7	6	3	June 6	13	4	Sept. 5	28	8	Dec. 5	44	14
" 14	10	1	" 13	14	5	" 12	51	10	" 12	29	13
" 21	10	2	" 20	10	1	" 19	50	10	" 19	18	3
" 28	8	3	" 27	7	1	" 26	25	10	" 26	37	7
April 4	15	6	July 4	22	3	Oct. 3	43	5	Jan. 2, '97	18	7

1897.

First Quarter.			Second Quarter.			Third Quarter.			Fourth Quarter.		
Week Ending.	Cases.	Deaths.	Week Ending.	Cases.	Deaths.	Week Ending.	Cases.	Deaths.	Week Ending.	Cases.	Deaths.
Jan. 9	11	0	April 10	6	3	July 10	18	0	Oct. 9	54	8
" 16	15	5	" 17	6	0	" 17	27	8	" 16	50	7
" 23	11	0	" 24	8	4	" 24	23	9	" 23	40	17
" 30	6	0	May 1	3	2	" 31	34	8	" 30	37	5
Feb. 6	7	2	" 8	5	2	Aug. 7	48	11	Nov. 6	28	9
" 13	13	0	" 15	13	1	" 14	63	9	" 13	30	9
" 20	6	2	" 22	8	6	" 21	33	9	" 20	26	4
" 27	9	7	" 29	12	4	" 28	29	12	" 27	38	5
March 6	4	3	June 5	10	3	Sept. 4	50	7	Dec. 4	46	7
" 13	8	2	" 12	11	2	" 11	28	7	" 11	61	14
" 20	5	2	" 19	7	3	" 18	38	6	" 18	34	13
" 27	8	0	" 26	10	8	" 25	40	9	" 25	27	7
April 3	2	4	July 3	13	5	Oct. 2	32	4	Jan. 1, '98	17	8

TABLE III.—*Continued.*

1898.

First Quarter.			Second Quarter.			Third Quarter.			Fourth Quarter.		
Week Ending.	Cases.	Deaths.	Week Ending.	Cases.	Deaths.	Week Ending.	Cases.	Deaths.	Week Ending.	Cases.	Deaths.
Jan. 8	19	1	April 9	13	3	July 9	12	9	Oct. 8	102	19
" 15	12	0	" 16	10	0	" 16	10	3	" 15	66	12
" 22	9	1	" 23	3	0	" 23	12	2	" 22	99	15
" 29	8	2	" 30	12	5	" 30	23	4	" 29	66	14
Feb. 5	10	2	May 7	12	3	Aug. 6	20	4	Nov. 5	41	9
" 12	12	5	" 14	5	3	" 13	22	6	" 12	45	9
" 19	17	2	" 21	9	0	" 20	84	14	" 19	51	5
" 26	15	2	" 28	13	4	" 27	75	24	" 26	34	12
March 5	9	4	June 4	5	3	Sept. 3	156	15	Dec. 3	50	11
" 12	10	4	" 11	9	4	" 10	102	32	" 10	24	10
" 19	11	2	" 18	18	2	" 17	146	19	" 17	35	8
" 26	12	1	" 25	17	7	" 24	122	20	" 24	15	6
April 2	20	5	July 2	10	4	Oct. 1	131	17	" 31	22	4

1899.

First Quarter.			Second Quarter.			Third Quarter.			Fourth Quarter.		
Week Ending.	Cases.	Deaths.	Week Ending.	Cases.	Deaths.	Week Ending.	Cases.	Deaths.	Week Ending,	Cases.	Deaths.
Jan. 7	13	9	April 8	17	3	July 8	10	5	Oct. 7	45	13
" 14	13	3	" 15	7	1	" 15	26	6	" 14	53	12
" 21	9	2	" 22	8	2	" 22	19	4	" 21	57	14
" 28	6	1	" 29	10	6	" 29	27	4	" 28	50	10
Feb. 4	6	3	May 6	10	3	Aug. 5	18	7	Nov. 4	46	10
" 11	9	3	" 13	21	5	" 12	21	5	" 11	32	8
" 18	13	0	" 20	11	5	" 19	40	7	" 18	48	11
" 25	14	5	" 27	9	3	" 26	40	9	" 25	35	7
March 4	10	2	June 3	13	3	Sept. 2	52	6	Dec. 2	29	13
" 11	10	3	" 10	8	1	" 9	58	9	" 9	49	7
" 18	8	2	" 17	8	4	" 16	59	8	" 16	26	4
" 25	7	2	" 24	10	3	" 23	55	12	" 23	29	9
April 1	6	5	July 1	16	0	" 30	42	7	" 30	18	6

TABLE III.— *Continued.*

1900.

First Quarter.			Second Quarter.			Third Quarter.			Fourth Quarter.		
Week Ending.	Cases.	Deaths.	Week Ending.	Cases.	Deaths.	Week Ending.	Cases.	Deaths.	Week Ending.	Cases.	Deaths.
Jan. 6	16	3	April 7	6	3	July 7	22	5	Oct. 6	58	5
" 13	34	10	" 14	11	3	" 14	22	7	" 13	81	16
" 20	15	6	" 21	15	4	" 21	24	5	" 20	48	11
" 27	20	4	" 28	7	3	" 28	19	8	" 27	99	17
Feb. 3	9	7	May 5	11	1	Aug. 4	24	9	Nov. 3	58	9
" 10	6	4	" 12	17	7	" 11	30	9	" 10	49	12
" 17	13	5	" 19	13	2	" 18	29	8	" 17	59	7
" 24	20	7	" 26	11	4	" 25	35	5	" 24	49	10
March 3	4	1	June 2	15	5	Sept. 1	46	11	Dec. 1	73	11
" 10	5	2	" 9	25	1	" 8	60	12	" 8	60	10
" 17	13	4	" 16	26	7	" 15	86	14	" 15	71	15
" 24	22	1	" 23	15	4	" 22	63	16	" 22	51	14
" 31	11	3	" 30	24	5	" 29	90	12	" 29	55	10

TABLE IV.

TYPHOID FEVER IN MASSACHUSETTS. REPORTED CASES BY QUARTERS.

(Obtained by addition of figures in tables of cases of infectious diseases reported by months. See Table II, above.)

	1896.	1897.	1898.	1899.	1900.	1896-1900.
First quarter (3 months) .	308	339	292	321	349	1,609
Second " " " .	287	276	276	316	363	1,518
Third " " " .	865	651	804	1,110	951	4,381
Fourth " " " .	1,177	814	824	951	1,267	5,091

REPORTED DEATHS BY QUARTERS.

(Obtained by addition of figures in tables of weekly mortality returns from reporting cities and towns. See Table I, above.)

	1896.	1897.	1898.	1899.	1900.	1896-1900.
First quarter (13 weeks) .	84	82	61	75	73	375
Second " " " .	67	50	61	56	50	284
Third " " " .	129	133	120	144	110	636
Fourth " " " .	161	137	163	140	162	763

TABLE V.

TYPHOID FEVER IN NEW YORK CITY, 1896–1900.

(Obtained by tabulating figures obtained from weekly reports of local Department of Health.— New York City Record. See Table III, above.)

REPORTED CASES BY QUARTERS.

Quarter.	1896.	1897.	1898.	1899.	1900.	1896–1900.
First	121	105	164	124	188	702
Second	119	112	136	148	196	711
Third	394	463	915	467	560	2,799
Fourth	382	488	650	516	811	2,847

REPORTED DEATHS BY QUARTERS.

Quarter.	1896.	1897.	1898.	1899.	1900.	1896–1900.
First	53	27	31	40	57	208
Second	33	43	38	39	49	202
Third	106	99	169	89	121	584
Fourth	97	113	134	124	147	615

TABLE VI.

TYPHOID FEVER IN MASSACHUSETTS AND NEW YORK CITY, 1896–1900. DEATHS BY QUARTERS.

Corrected for duration of the disease. (Shifted back six weeks so that first quarter of the year includes period from the seventh to the twentieth week, and so on.)

MASSACHUSETTS.

Quarter.	1896.	1897.	1898.	1899.	1900.	1896–1900.
First	65	63	65	70	65	328
Second	70	62	55	74	57	318
Third	196	160	190	164	158	868
Fourth	107	100	112	97	131 [1]	547

[1] Includes first six weeks of 1901, figures 9, 9, 4, 12, 10, 6.

NEW YORK CITY.

Quarter.	1896.	1897.	1898.	1899.	1900.	1896–1900.
First	41	32	34	39	44	190
Second	54	76	52	50	71	303
Third	104	109	219	125	148	705
Fourth	67	69	77	81	125 [1]	419

[1] Includes first six weeks of 1901, figures 9, 8, 6, 11, 9, 5.

TABLE VII.

TYPHOID FEVER IN MASSACHUSETTS AND NEW YORK CITY, 1896-1900. DEATHS BY QUARTERS.

Corrected for duration of the disease. (Shifted back three weeks so that first quarter of the year includes period from the fourth week to the seventeenth week, etc.

MASSACHUSETTS.

Quarter.	1896.	1897.	1898.	1899.	1900.	1896-1900.
First	75	72	65	63	65	340
Second	68	51	53	58	55	285
Third	162	155	161	165	138	781
Fourth	137	113	144	116	140	650

NEW YORK CITY.

Quarter.	1896.	1897.	1898.	1899.	1900.	1896-1900.
First	45	29	32	32	48	186
Second	42	53	49	48	56	248
Third	110	114	201	113	136	674
Fourth	82	83	102	104	138	509

TABLE VIII.

TYPHOID FEVER IN BERLIN, 1889-98. REPORTED CASES.
(Statistisches Jahrbuch der Stadt Berlin.)

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1889	60	337	144	83	94	81	172	181	94	93	256	85
1890	83	54	32	49	56	47	71	107	149	61	38	38
1891	40	61	62	33	36	35	139	118	166	165	53	53
1892	33	44	25	28	24	38	40	77	133	60	46	41
1893	28	16	25	42	37	26	49	96	229	52	35	16
1894	13	17	12	17	21	15	28	47	54	23	30	24
1895	21	8	12	7	35	43	48	86	79	63	40	31
1896	28	17	13	11	19	17	53	60	35	37	17	11
1897	9	16	18	10	12	33	44	94	59	19	30	30
1898	15	14	12	24	20	21	29	52	61	38	27	18
Total . .	330	584	355	301	354	356	673	918	1,059	611	572	347

TABLE VIII.—*Continued.*

DEATHS AMONG REPORTED CASES.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1889	7	43	32	11	12	7	19	17	15	14	34	10
1890	8	12	7	9	11	5	11	15	8	5	8	1
1891	6	7	11	3	4	5	6	12	11	16	16	4
1892	11	4	12	3	4	4	5	5	12	9	9	8
1893	9	3	5	3	9	5	3	12	23	9	7	4
1894	2	1	5	4	5	2	4	2	7	6	2	9
1895	4	4	6	2	1	10	7	9	17	15	8	11
1896	1	4	3	6	2	2	1	4	8	5	2	3
1897	2	0	4	6	1	3	0	12	9	6	4	4
1898	7	3	2	2	1	2	4	8	4	8	7	3
Total . .	57	81	87	49	50	45	60	96	114	93	97	57

TABLE IX.

TYPHOID FEVER CASES AND DEATHS. PROVIDENCE, R. I., 1885-1900.
(Report, Superintendent of Health, for 1900.)

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Cases . .	207	127	134	110	95	89	132	246	344	342	551	385
Deaths .	69	44	48	45	48	38	47	67	72	90	106	128

TABLE X.

CASES OF TYPHOID FEVER ADMITTED TO THE MASSACHUSETTS GENERAL HOSPITAL, 1891-1900. CLASSIFIED ACCORDING TO MONTH OF ADMISSION.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1891	4	8	2	6	3	3	7	20	28	25	7	6
1892	2	2	2	2	3	5	9	10	37	25	7	6
1893	2	1	3	1	5	5	9	22	17	10	13	6
1894	7	7	3	2	3	7	8	18	34	16	14	2
1195	3	3	2	2	7	9	6	24	28	20	13	6
1896	3	2	4	4	4	5	11	22	30	37	12	11
1897	4	1	1	1	1	4	6	24	17	21	12	5
1898	6	3	4	4	0	10	10	55	67	26	18	17
1899	8	1	2	9	11	8	10	33	43	31	15	9
1900	7	7	4	8	7	7	14	28	33	33	18	25
Total . .	46	35	27	39	44	63	90	256	334	244	129	93

TABLE X.—*Continued.*

CASES OF TYPHOID FEVER AT THE MASSACHUSETTS GENERAL HOSPITAL WHICH TERMINATED FATALLY, 1891-1900. CLASSIFIED ACCORDING TO MONTH OF ADMISSION.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1891	2	..	1	2	..	1	.	5	3	..	1	..
1892	..	1	..	..	..	..	1	2	7	4	1	..
1893	..	..	1	..	..	1	2	1	3	2	2	..
1894	1	..	..	2	..	2	1	2	6	1	2	2
1895	..	..	..	1	1	..	2	4	3	1	2	2
1896	..	..	..	..	..	..	2	2	3	3	5	..
1897	..	..	..	..	1	1	..	5	..	2	2	1
1898	2	..	2	..	..	..	1	6	7	4	1	2
1899	2	..	..	..	1	1	..	2	4	6	..	2
1900	2	..	2	..	2	..	..	2	5	3	2	3
Total . .	9	1	6	5	5	6	9	31	41	26	18	12

TABLE XI.

CASES OF TYPHOID FEVER ADMITTED TO THE BOSTON CITY HOSPITAL, 1888-97. CLASSIFIED ACCORDING TO MONTH OF ADMISSION.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1888	7	1	11	5	18	19	14	45	89	57	25	15
1889	17	8	6	7	9	15	49	83	97	52	25	16
1890	7	12	12	8	13	7	21	51	69	57	25	17
1891	12	7	7	6	15	20	42	47	93	92	39	13
1892	3	6	16	11	12	16	19	31	55	42	36	18
1893	8	9	6	10	20	15	30	44	54	37	33	14
1894	3	2	9	12	12	11	18	70	77	73	31	15
1895	4	3	6	4	15	14	29	69	70	48	22	22
1896	17	6	7	11	17	17	30	70	71	75	49	39
1897	10	13	9	16	11	10	10	27	22	16	15	11
Total . .	88	67	89	90	142	144	263	537	697	549	300	180

TABLE XI.—*Continued.*

CASES OF TYPHOID FEVER AT THE BOSTON CITY HOSPITAL WHICH TERMINATED FATALLY, 1888-97. CLASSIFIED ACCORDING TO MONTH OF ADMISSION.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1888	1	0	2	2	2	2	2	3	12	7	4	3
1889	4	1	0	1	2	4	6	11	11	5	3	2
1890	1	1	2	2	2	0	5	6	3	4	2	3
1891	2	1	2	1	1	0	3	6	14	7	2	1
1892	2	0	2	2	3	2	4	4	10	5	4	4
1893	3	3	1	1	6	1	5	3	8	6	7	1
1894	0	0	0	1	2	2	2	9	12	5	5	2
1895	0	1	3	1	6	3	4	7	7	4	1	3
1896	4	1	0	4	1	3	5	5	6	8	7	3
1897	1	1	4	2	4	2	2	4	4	1	1	1
Total . .	18	9	16	17	29	19	38	58	87	52	36	23